tion of star constants, presented by Professor Turner ; C. A. Young, The Sun, new edition, presented by the author ; Photographs of Spectra taken with the Bruce spectroscope, presented by Mr. Newall ; Various volumes of MS., presented by Messrs. W. Wesley and Son.

Note on the Mean Motions of the Lunar Perigee and Node.
By Professor Ernest W. Brown, Sc.D.

The values given in my paper in the *Monthly Notices* 1897 March, for the mean motions of the perigee and node require slight corrections to make the comparison with Hansen's values complete. Although these corrections are much less than the possible errors which I thought it necessary to assign, and may be supposed to be included therein, there is a perceptible effect on the differences between the various results in the case of the perigee, and further my theoretical result for it comes much closer to that of Hansen. The nature of the correction is as follows :—

The disturbing function is of the form $m'Q$, where m' is the mass of the Sun and Q is a function of the solar and lunar coordinates. As is usual, we put $m' = n'^2 a'^3$, instead of $m' = n'^2 a'^3 - E - M$, where n', a' are the solar mean motion and mean distance, and E, M, the masses of the Earth and Moon. Hansen uses the latter, which is the correct substitution for m'.

The correction is in general sufficiently accounted for if we multiply all the terms of the first order of the disturbing forces by

$$1 - \frac{E+M}{m'} = 1 - \frac{1}{330000}, \text{ approximately;}$$

those of the second order by

$$\left(1 - \frac{E+M}{m'}\right)^2 = 1 - 2\frac{E+M}{m'}, \text{ approximately.}$$

It is in all cases sufficient to consider the terms of the first order only in making this correction, except in the motion of the perigee, where the terms depending on the square of the disturbing forces are about equal in magnitude to those depending on the first power.

Hence, putting ϖ_1, θ_1 for the mean motions of the perigee and node, the corrections will be, with a sufficient approximation,

$$-\frac{1}{2}\varpi_1 \cdot \frac{E+M}{m'} - \frac{1}{2}\varpi_1 \cdot 2\frac{E+M}{m'} = -\frac{3}{2} \cdot \frac{1}{330000}\varpi_1,$$

and

$$-\theta_1 \cdot \frac{E+M}{m'} = -\frac{1}{330000}\varpi_1,$$

respectively.

The theoretical values of the annual mean motions, given in the paper, and there numbered (i), are

$$+146\ 435''\cdot3 \pm 1''\cdot8, \qquad -69\ 679''\cdot5 \pm 1''\cdot1.$$

The corrections examined above are therefore

$$-0''\cdot7, \qquad \div 0''\cdot2\ ;$$

making my theoretical values

$$+146\ 434''\cdot6 \pm 1''\cdot8, \qquad -69\ 679''\cdot3 \pm 1''\cdot1.$$

The former is now quite close to the corrected value of Hansen—that previously numbered (iv)—which is 146 434″·9. The difference from the observational value is now 1″·0, but, as I remarked before, no argument can be based on this. The argument in the case of the node is quite unaffected ; the error of 2″·0 in Hansen's theoretical result remains.

Haverford College, Pa.:
1897 May 1.

On some Spectroscopic Determinations of Velocity in the Line of Sight made at the Cambridge Observatory. By H. F. Newall.

The present note gives some results recently obtained in determinations of velocity in the line of sight with the Bruce spectroscope attached to the 25-inch refractor (the Newall telescope) of the Cambridge Observatory (*Monthly Notices*, lvi. p. 98).

The instrument was used for determinations of velocity and for the careful study of a few spectra throughout the year 1896 ; but on account of more or less systematic differences between the results obtained from the photographs and the results obtained by Dr. Vogel at Potsdam, it was necessary to subject the instrument to an even more searching investigation than it received in the course of the first adjustment. The difficulty has been the setting of the comparison spectrum, and the investigation has been of a very troublesome kind, as has already been indicated in the annual reports (see present vol. *Monthly Notices*, p. 250). The instrument is now apparently in excellent adjustment. The test photographs are completely satisfactory, and moreover the velocities deduced for several bright stars are in good agreement with those deduced by Dr. Vogel from photographs taken with the Potsdam spectrograph.

The cause of the systematic discrepancies above referred to has been discovered. A minute deflection of the collimator had been produced every time the comparison prisms were used. The deflection was traced to a deformation of a plate at the end of the strong frame of the spectroscope, brought about by altera-

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